What is Claimed Is:

1. An apparatus for detection and measurement of trace species in at least one of a sample gas and a sample liquid comprising:

a passive fiber optic ring having a portion thereof exposed to the sample gas or sample liquid;

a coherent source of radiation;

coupling means for i) introducing a portion of the radiation emitted by the coherent source to the passive fiber optic ring and ii) receiving a portion of the radiation resonant in the passive fiber optic ring;

a detector for detecting a level of the radiation received by the coupling means and generating a signal responsive thereto; and

a processor coupled to the detector for determining a level of the trace species in the gas sample or liquid sample based on the signal generated by the detector.

2. The apparatus according to claim 1, wherein the level of the trace species is determined based on a rate of decay of the signal generated by the detector.

3. The apparatus according to claim 1, wherein the coupling means is a single optical coupler.

4. The apparatus according to claim 3, further comprising a filter placed in an optical path between the coupling means and the detector to selectively pass the received portion of radiation from the passive fiber optic loop to the detector.

5. The apparatus according to claim 4, wherein the filter passes radiation to the detector based on a wavelength of the radiation.

6. The apparatus according to claim 1, wherein the coupling means includes i) a first coupler for introducing the portion of the radiation emitted

by the coherent source to a first section of the fiber optic ring and ii) a second coupler for receiving the portion of the radiation in the passive fiber optic ring at a second section thereof.

7. The apparatus according to claim 1, wherein the exposed portion is a cladding of the fiber.

8. The apparatus according to claim 1, wherein the exposed portion is an inner core of the fiber.

9. The apparatus according to claim 1, wherein coherent source of radiation is an optical parametric generator.

10. The apparatus according to claim 1, wherein coherent source of radiation is an optical parametric amplifier.

11. The apparatus according to claim 1, wherein coherent source of radiation is a laser.

12. The apparatus according to claim 1, wherein the coherent source of radiation is a pulsed laser.

13. The apparatus according to claim 1, wherein the coherent source of radiation is a continuous wave laser.

14. The apparatus according to claims 11, 12 or 13, wherein the laser is an optical fiber laser.

15. The apparatus according to claim 13, wherein the continuous wave laser is a tunable diode laser having a narrow band.

16. The apparatus according to claim 15, further comprising an isolator coupled between the laser and the coupling means and in line with the radiation emitted from the laser, the isolator minimizing noise in the laser.

17. The apparatus according to claim 1, wherein an evanescent field of the radiation traveling within the fiber is exposed to the sample gas or sample liquid.

18. The apparatus according to claim 17, wherein the absorption of the radiation from the fiber increases a rate of decay of the radiation received by the coupling means.

19. The apparatus according to claim 1, wherein the passive resonant fiber is formed from one of fused silica, sapphire and fluoride based glass.

20. The apparatus according to claim 1, wherein the passive resonant fiber is formed from a hollow fiber.

21. The apparatus according to claims 19 or 20, wherein the passive resonant fiber is a single mode fiber.

22. The apparatus according to claims 19 or 20, wherein the passive resonant fiber is a multi-mode fiber.

23. The apparatus according to claim 1, further comprising at least one cylindrical body having a predetermined diameter and wrapped with the exposed portion of the optical fiber, wherein exposure of the evanescent field to the trace species is enhanced by increasing a penetration depth of the evanescent field.

24. The apparatus according to claim 1, further comprising a plurality of cylindrical bodies having respective predetermined diameters and wrapped with respective sections of the exposed portion of the resonant fiber.

25. The apparatus according to claims 23 or 24, wherein the tubular structure is a mandrel.

26. The apparatus according to claim 25, wherein the mandrel has a cross sectional radius of at least about 1 cm.

27. The apparatus according to claim 25, wherein the mandrel has a cross sectional radius of between about 1 cm and 10 cm.

28. The apparatus according to claim 1, wherein the trace species is at least one of water, acetylene and ammonia.

29. The apparatus according to claim 28, wherein the coherent source is a single mode laser tunable in the wavelength region of about 1390 nm and about 1513 nm.

30. The apparatus according to claim 1, wherein the passive fiber optic ring resonates at a wavelength between a visible to a mid-infrared region of an electro-magnetic spectrum.

31. The apparatus according to claim 1, wherein at least a portion of the passive fiber optic ring is disposed within the liquid sample for determining a presence of the trace species in the liquid sample.

32. The apparatus according to claim 1, wherein at least a portion of the passive fiber optic ring is coated with a material to selectively increase a concentration of the trace species at the coated portion of the fiber optic ring.

33. The apparatus according to claim 32, wherein the material attracts analyte molecules of the trace species.

34. The apparatus according to claim 33, wherein the material is polyethylene.

35. The apparatus according to claim 32, wherein at least the coated portion of the passive fiber optic ring is disposed within the liquid sample for determining a presence of the trace species in the liquid sample.

36. The apparatus according to claim 1, further comprising an input detector for determining when energy from the laser is provided to the fiber optic ring.

37. The apparatus according to claim 36, further comprising control means to deactivate the laser based on the receiving means receiving radiation from the fiber optic ring after the input detector determines that the laser provided energy to the fiber optic ring.

38. The apparatus according to claim 37, wherein the control means and the input detector are coupled to the processing means.

39. The apparatus according to claim 1, wherein an index of refraction of the fiber is greater than an index of refraction of the sample liquid.

40. The apparatus according to claim 1, wherein an index of refraction of the fiber is based on an index of refraction of the sample gas and an absorption band of the trace species.

41. The apparatus according to claim 1, wherein the portion of the radiation coupled into the fiber optic ring is less than about 1% of the radiation provided to the coupling means.

42. The apparatus according to claim 1, wherein the portion of the radiation coupled into the fiber optic ring is variable.

43. The apparatus according to claim 1, wherein the portion of the radiation coupled into the fiber optic ring is varied based on a loss within the passive fiber optic loop.

44. The apparatus according to claim 43, wherein the loss within the passive fiber optic loop is based on at least connector losses and fiber losses.

45. The apparatus according to claim 1, wherein the fiber optic ring is at least about 1 meter long.

46. The apparatus according to claim 1, wherein the fiber optic ring is at least about 10 meters long.

47. The apparatus according to claim 1, wherein the fiber optic ring is at least about 1 Km long.

48. An apparatus for detection and measurement of trace species in at least one of a sample gas and a sample liquid comprising:

a passive resonant fiber optic ring having a portion exposed to the sample gas or sample liquid;

a coherent source emitting radiation;

a first optical coupler to provide at least a portion of the radiation emitted by the coherent source to a first section of the passive resonant fiber ring;

at least one cylindrical body coupled to a portion of the exposed fiber optic ring to form the portion of the exposed fiber optic ring with a predetermined radius, at least a portion of the sample liquid or sample gas contacting the formed portion of the fiber optic ring;

a second optical coupler for receiving a portion of the radiation in the passive resonant fiber ring from a second section of the resonant fiber ring; and

a processor coupled to the second optical coupler for determining a level of the trace species in the gas or liquid sample based on a rate of decay of the radiation received by the second optical coupler.

49. The apparatus according to claim 48, further comprising a first optical detector coupled between the second optical coupler and the processor for generating a signal responsive to the radiation received by the second optical coupler.

50. The apparatus according to claim 48, further comprising a second optical detector coupled between the first optical coupler and the processor for determining when energy from the laser is provided to the passive fiber optic ring.

51. The apparatus according to claim 50, wherein the second optical detector generates a trigger signal to the processor responsive to receiving radiation from the coherent source.

52. The apparatus according to claim 48, wherein the first and second optical couplers are a unitary coupler.

53. A method for detecting and measuring a trace species in at least one of a sample gas and a sample liquid, the method comprising:

exposing a portion of an optic fiber of a passive fiber optic ring to the sample gas or sample liquid;

emitting radiation from a coherent source;

coupling at least a portion of the radiation emitted from the coherent source into the fiber optic ring;

receiving a portion of the radiation travelling in the fiber optic ring; and

determining the level of trace species in the gas or liquid sample based on a rate of decay of the radiation within the fiber optic ring.

54. A method according to claim 53, further comprising the steps of:

forming, with a predetermined radius, at least a portion of the exposed portion of the passive fiber optic ring based on an absorption frequency of the trace species; and

exposing the formed portion of the fiber to the sample liquid or sample gas.

55. A method according to claim 54, further comprising the step of exposing an evanescent field of the radiation traveling within the fiber to the sample gas or sample liquid.

56. A method according to claim 55, further comprising the step of determining the level of the trace species in the sample gas or sample liquid based on the rate of decay of the radiation in the fiber responsive to an absorption of the radiation by the trace species.